SCIENCE.

FRIDAY, OCTOBER 23, 1885.

COMMENT AND CRITICISM.

IT IS REPORTED that the President has virtually decided to postpone the appointment of the superintendent of the coast and geodetic survey until after the meeting of congress. This, if true, will be regretted by all interested in the survey, as it is essential that when congress assembles there shall be some one to speak with authority about the needs and work of the survey. As the matter now stands, congress will have no one to look to for a policy.

AN INTERESTING DISCUSSION took place at the meeting, October 9, of the Naval institute at Annapolis on the subject of arctic exploration. C. R. Markham, of the Royal geographical society, presided, and the essayist of the evening was Lieut. J. W. Danenhower of the Jeannette expedition. The point of the paper was the inadvisability of further arctic exploration, and the speaker declared himself as definitely opposed to further exploration of the polar region bounded by the 85th parallel. He considered that geographical discovery is not of sufficient importance to warrant exposure to the dangers to be encountered there, and that there is no special reason for supposing that the meteorological phenomena of the polar region differ essentially from those which may be observed near its borders. The paper was supplemented by others received from Chief engineer Geo. W. Melville, U.S.N., Sir Geo. Nares, and Lieutenant Greely, and verbally discussed by Dr. E. Bessels of the Polaris expedition, and Mr. Markham. Letters in favor of further arctic exploration were read from Prof. J. E. Nourse, U.S.N., and Dr. H. Rink, formerly governor of the Danish colonies in Greenland.

The tenor of the discussion, generally, was to the effect that, while it might be admitted that further exploration could not be justified on utilitarian and commercial grounds, nevertheless, without reference to scientific results, the world could not but gain by the examples of determination and heroism which arctic exploration may be counted on to develo pin the future, as it has done in the past, that individuals and nations cannot afford to gauge their endeavors by a merely commercial standard; and, last, that in regard to the facts of terrestrial physics to be determined by arctic exploration, the essayist had come to an unwarranted conclusion. The latter view was especially insisted on in a vigorous and comprehensive statement by Mr. Markham.

There can be but one opinion among men of science in regard to a certain sort of arctic expedition. A vague 'patriotic' impulse to plant the flag of any given country at the pole, taken by itself, is no more entitled to respect than is the motive which prompted the wanderings of 'Sergeant Bates' over regions generally accessible. An expedition fitted out for mere glory, without any definite scientific object or well matured and clearly understood plan, officered by men whose courage, enthusiasm and inexperience are their only qualifications, is in no respect to be commended. Such expeditions have had their share of the glory they sought, and have contributed an enormous proportion to the total of arctic disaster. It is to be hoped that there will be no more of them, in spite of the fact that they have also contributed something to the common stock of knowledge. Scientific exploration of the arctic regions will go on. Like other undertakings which depend for the sinews of war upon national or individual interest and liberality, it will have its periods of activity and of inaction. But that the crown of the sphere shall be left to solitude and the auroras, while science with her questions and man with his ambitions coexist upon this planet, is a proposition requiring no refutation.

THE NECESSITY OF PAYING greater attention to the study of geography in its widest sense is gradually becoming admitted in European countries. The *Revue de géographie* cites, with appropriate comments, a recent discussion in the French senate on this subject, by M. Bardoux, formerly Minister of public instruction, and M. Goblet, at present holding that office. In brief, the former called attention to the need of more and better geographical teaching, both in Paris and the provinces, and to the isolation of the present teachers. He urged

the creation of more professorships and the propriety of combining their forces into a national faculty, institute, or school, of advanced geographical teaching. In this way no additional expense would be required, and yet the work might be more effectively carried on.

The minister in replying evinced his sympathy with the view that geography was growing daily more important and should be more widely taught. He declared his desire for more numerous chairs of that science, and that it should be taught more effectively, but doubted whether it were desirable that any centralized body should undertake instruction of that science separately, evidently believing that it should be taught in conjunction with other branches of learning. He also pointed out that much progress had already been made. Four professorships of geography have been created since 1870, and more than ten others combine history and geography, besides which there are several courses of lectures on geographical subjects. M. Drapeyron, the editor of the review, is devoted to the project of a national school of geography, and has constituted himself its apostle in France. By geography is, of course, meant 'knowledge of the earth' in its widest sense, and not merely a smattering of political divisions, large towns and the most salient physical features, mixed with a little history, ethnology, architecture and cartography, which passes muster for the science of geography in most of our schools.

Great Britain has recently been stirring in the matter of geographical teaching, and, though this country has benefited greatly by the work and presence of such men as Guyot and Maury, and by the constant progress of actual exploration, which has made certain aspects of geography familiar to the public mind, yet even here the teaching of this science leaves much to be desired, and it is not yet, we believe, recognized by a full professorship in any of our universities.

ASTRONOMERS AT MOST observatories must envy those at Nice their clear skies. M. Charlois of that observatory was the first to pick up Tuttle's comet at its late return, and, although it was only possible to observe it for ten or fifteen minutes each morning, between its rising-time and twilight, yet, in spite of its faintness, nearness to the horizon, and this limited time, he was able to compare its position with that of neighboring stars on six consecutive days after discovery, thus furnishing plenty of data for fixing the time of perihelion passage and correcting the elements of its orbit, even if no other observations are secured at this return. The same observer also obtained good observations of Barnard's comet on the seven consecutive nights following the telegraphic announcement of its discovery. These are records that could be made at very few places outside the sunny skies of southern France and Italy.

THE RELATIVE IMPORTANCE of astronomy and meteorology, as looked upon in some parts of the world, is well illustrated in a volume just published whose title page reads: "Meteorological observations made at the Adelaide observatory, and other places in southern Australia and the northern territory, during the year 1882, under the direction of Charles Todd, C. M. G., F. R. A. S., observer, postmaster-general, and superintendent of telegraphs." The volume is a folio of 298 pages, of which all but two are devoted to meteorology. These two describe the astronomical work of the Adelaide observatory for 1882, the first being devoted to the observation of ten phenomena of Jupiter's satellites, of which only two are eclipses, the phenomena timed in these cases being described as 'first seen,' 'quite distinct,' and 'full blaze.' The other page is devoted to the director's observations upon the transit of Venus of December 7, made at Wentworth. The description of the determination of the latitude of the observing station is worth quoting. "The latitude, deduced from eleven meridian altitudes, kindly taken with a sextant by Mr. J. W. Connolly, surveyor, is 34° 6′ 24.7″."

THE ALERT EXPEDITION.

THE steamer Alert, Lieutenant Gordon, R. N., commanding, arrived at St. John's, N. F., Oct. 14, from her second attempt to reach Hudson Bay, having visited all the stations where observers had been placed in 1884, relieving the parties and supplying their places by fresh observers. All were well, only one death, that of a station hand by scurvy, having been reported. One of the stations was found deserted, but the party, fearing the Alert might not reach them, had taken passage on the Hudson Bay company's steamer Labrador. The results of work at the stations have been favorable, though exact details have not yet been received. The Alert reached her destination

without difficulty, and those most interested in the route by Hudson Bay to Europe for the wheat of Manitoba, are enthusiastic in their assertions that this proves the practicability of the route. A sober second thought, however, would indicate that, as far as yet made public, absolutely nothing new has been learned on the voyage of the Alert. The character of the navigation of Hudson Bay, a great shoal inlet, with its bottom dotted with stupendous bowlders often rising nearly to the surface; with no good port in the southwest, where, at the best anchorage, the vessel lies eight or nine miles from what must be the shipping point, permanent piers of any length being out of the question, owing to the movements of the ice; a strictly arctic climate, constant mirage, and no charts of any value: these incidents of the plan do not seem to be affected by anything done on the voyage as far as yet known.

USE AND ABUSE OF LEARNED SOCIETIES.

EVERY country thinks, doubtless, when it looks at the peculiar way in which things are done in other countries, that it could devise a method of much more dignity and wisdom for carrying out its purposes. We may certainly be excused for thinking that the plans by which great men are selected in both England and France might be improved upon. The familiar story of the candidate for the fortieth arm-chair of the French academy going about and soliciting the votes of thirty-nine immortals, never fails to give one an unpleasant shock at every fresh hearing. Even our presidential candidates are considered to be deficient in dignity when they make public speeches in their own behalf, and the literary man is supposed to be a man of much more delicate feeling than any politician. Nor is the English way of granting admission into the Royal society at all to be preferred; to hold an actual competitive examination, on the result of which a certain number of successful candidates are annually chosen, is not to show deference to the feelings of the candidate any more than the French have done.

There is a simple principle that should guide the bestowal of honors,—it is that they should be given and not sought. In private life a man is not expected to press his merits or his company upon his friends. We should consider it a barbarous social etiquette in which a person was required to call upon all his acquaintances and beg to be invited to their choicest dinners. If rewards are to be given at all for distinction in science or in letters, they should be given freely, and not be made bitter by conditions to which a gentleman has never before been obliged to submit. It may be a difficult matter to make the proper choice, but, at least, it should be made without the assistance of the candidate himself.

The English method has the additional disadvantage that it does not secure the men whom it is most desirable to honor. During the school-boy period, the distinction between different individuals is a distinction of learning, and an examination is not unfitted to discover the boy who deserves reward. But learning is not the quality which a state needs to make it great. Casaubons are not the kind of men who have built up English science. The qualities which ought to be encouraged, and which it should be a nation's delight to honor, are qualities too subtle to be detected by a competitive examination. That is a way of dealing out honors which, as Professor Chrystal has just said before the British association, belongs to the pupillary age both of men and of nations.

In our own national academy, whose tender age forbids as yet the lustre that clings to the ancient institutions of the European capitals, the only knowledge a man may have that he is a candidate for election is through the imprudence of his friends among the academicians,—an imprudence which is unhappily too common. Indeed it is becoming evident to many that the candidate active in pushing his own claims, in however secret a manner, is *pro tanto* lessening his chances of admission. And this is as it should be; merit in the eyes of others should be the single test.

THE RECENT EDUCATIONAL MEETING IN BOSTON.

THE educational conference, which met on Friday and Saturday, Oct. 16 and 17, at the Boston Latin school, was one of the most notable ever held in America, by reason of the representative character of the delegates, the nature of the topics discussed, and the possible effect upon our higher education of the movement there inaugurated.

The teachers of the preparatory schools have for some time been conscious of certain difficulties arising from the lack of a proper understanding on their part of what the colleges really desire of them, and particularly as regards the requisitions for admission to college, in the determination of which, they, however interested parties, have never been recognized as having a voice. Addi-

tional subjects have been added from time to time to the requirements, additional quantities also in the traditional subjects, while each college has more or less contributed to the diversity of the programme submitted to the preparatory schools.

Those unsatisfactory relations were the subject of a very frank discussion at the meeting of the Massachusetts classical and high school teachers association in 1884. Resolutions were passed setting forth the desirability of a meeting of delegates of that body with representatives of the New England colleges to consider matters of common interest, and at the following meeting, in April, 1885, a committee was appointed to make arrangements for such a conference.

The response of the colleges was most cordial, as may be inferred from the fact that fourteen colleges were represented at the recent meeting, and eleven of these by their presidents. Nearly every one of the leading academies which fit for college, as well as many of the public high schools of the larger New England cities and towns, were also represented by their principals.

The programme of the meeting involved the presentation of only four papers, with a discussion of each. Two of these were prepared by persons connected with colleges and two by preparatory teachers, and in each instance the discussion was opened by a delegate representing the alternate interest. From the side of the colleges, President Porter of Yale spoke on the question, 'How can the preparatory schools coöperate more effectively with the colleges?' and Professor Fay of Tufts college had prepared an answer to the query, 'What are some of the most prominent and prevailing defects in the preparation of candidates for college?' the material cited in evidence being collated from nine leading colleges. The questions, 'Is any greater degree of uniformity in the requisitions for admission to college practicable?' and, 'Under what conditions might admission to college by certificate be permitted?' were treated respectively by Principal Bancroft, of Phillips academy, Andover, and Dr. Robert P. Keep of the Free academy, Norwich, Conn., while the discussions on these topics were opened by President Eliot of Harvard and President Robinson of Brown university.

The papers were characterized by the completest frankness, and the evils which stand in the way of a consistent, consecutive, and honest national system of education, were unflinchingly faced. The representatives of the colleges were given a clear understanding of the practical difficulties they created for the fitting schools, while the teachers of those schools learned, perhaps for the first time, just how the products of their efforts are regarded by the college professors, into whose hands they are committed for a continuance of the work begun by them. The showing was anything but gratifying to our national vanity, for the fact was not overlooked that the colleges find it hardly possible to correct the careless or lazy intellectual habits contracted in the preparatory schools. On the other hand, the colleges were held responsible for the larger part of the evil, owing to the excessive burden put by them upon the schools. The traditional absurdity of setting quantity above quality in the requirements for admission to college was boldly criticised, and hopes were expressed that some plan, that will prove satisfactory to all parties, may yet be devised for admission of students upon the certificate of competent teachers that they are prepared to pursue a collegiate course with profit.

If any came to the meeting skeptical as to any practical results of a conference of two classes of teachers, whose work, however naturally a unit, has thus far been conducted in entire independence, the one part of the other, he must have been happily disappointed. When one considers the staleness of the subjects usually treated at educational meetings, the threshing of old straw, and the half-dreariness of the interest manifested in many cases by the leaders, the freshness and enthusiasm of the conference were something worthy of especial comment. While to the college men certain of the subjects were perhaps commonplace, they came with a degree of freshness to the teachers of the schools; and so, on the other hand, it was something quite new for the presidents and professors to hear clearly voiced the sentiments of the preparatory teachers, of which they had heard only vague echoes. Hence, when the programme of papers and discussions was ended, the conference, with an eager unanimity, resolved itself into a permanent organization, to be known as the 'New England association of colleges and preparatory schools.'

The first practical result of the conference was the passage of the following resolutions with regard to uniformity of requisitions:

First,—Resolved, That this conference of college presidents, principals and teachers in preparatory schools, earnestly appeals to the colleges for concerted action on their part in order to secure uniform requisitions in all subjects and authors in which they have a common requirement.

Second,—Resolved, That this conference urge upon the colleges a still closer agreement on their part as to the subjects to be set for examination, the recommendations to be made to the schools, and the nature and extent of the entrance examinations.

Third,—Resolved, That this conference request the colleges to make reasonable announcement of any changes in the requirements for admission.

Fourth,—Resolved, That this conference request the colleges to unite in prescribing definitely the subjects which may be offered at the partial or preliminary examinations, the minimum number for which a certificate will be given, and to decide whether a final examination may be converted in any case into a preliminary examination, or a preliminary examination into a final examination, and if so, on what terms.

Fifth,—Resolved, That this conference urge upon the colleges coöperation and comity, either in accepting each other's certificates of examination, or in establishing jointly an examining board, whose duty it shall be to set papers, conduct examinations, and issue certificates on their behalf, which certificates shall be good in any college in the syndicate.

Naturally the public at large is not so directly interested in this particular subject of uniform requisitions as the preparatory teachers, but certain cognate topics of a general interest cannot fail to be considered in connection with this matter. First of all, and of the greatest importance in view of the very bad state of affairs shown by the paper upon prominent and prevailing defects in the preparation of candidates for college, the relative value of a thorough grounding in the elements of each of the subjects on which the candidate is required to be examined, as compared with the present superficial attempt to perform an excessive stint, cannot fail to be considered. Science cannot fail to derive a direct advantage from a change for the better in this particular. If, as it appears, inaccuracy and lack of intellectual independence are the striking defects noticeable among college students, any reform which shall tend to do away with such unscientific, as well as unscholarly deficiencies, will be of benefit in increasing the number of educated men from whom science has something to hope.

AN ADVANCE IN FISH CULTURE.

NOTWITHSTANDING the successes of fish culture in replenishing the depleted waters of our Pacific slope with quinnat salmon, those of the great lakes with white-fish, and the rivers of the east with shad, little has resulted from the efforts to restore Salmo salar to its native haunts in New England, or to acclimate it in the Hudson, the Susquehanna or the Potomac. The introduction of the quinnat salmon into Atlantic waters has as yet not been accomplished, and the attempts toward this end must be classed as experimental, rather than actual fish culture. In an infant art like fish culture, the only road to success is through scientific experimentation, and it is the freedom with which tentative work has been done by the U. S. fish commission, which has placed American fish culture so far in advance of that of the old world.

Experimental fish culture has frequently led to practical results in a manner not at all anticipated; never, however, more strikingly than in the recent salmon work in the basin of the Hudson. In 1883, through the coöperation of the U. S. commission with one of the commissioners of the state of New York, 40,000 fry of salmon were brought from the Penobscot and placed in Clendon Brook, near Glens Falls, N. Y. The brook was placarded and policed, and this fall it is found to be alive with young salmon throughout its entire length. There are numerous fish just ready to be transformed from 'parrs' into 'smolts;' these are about six inches long, and will, doubtless, soon go out to sea to return in about three years as adult salmon. There are also numerous smaller fish, representing the 60,000 fry which were planted in the same stream last April. The larger ones take the fly with great eagerness.

Heretofore, in planting salmon, it has been customary to place the little fish in the streams and allow them to care for themselves, but the new idea of placing them in protected preserves, where they can be cared for by the people living near at hand, and their growth to the proper size assured, will, no doubt, revolutionize salmon culture.

A similar experiment has lately been made at the station of the U. S. fish commission at Wytheville, Va., where 30,000 California trout have been confined until they have become vigorous fish of half a foot in length; they will be used, instead of helpless fry just freed from the yolk sac, in stocking the Atlantic slope with this fine species.

The conclusion of the Clendon Brook experiment will be eagerly looked for, not only by anglers and economists, but by zoölogists generally, to whom the extension of the actual habitat of a large river fish, some three degrees to the southward, will be a matter of considerable interest.

THE FLOOD ROCK EXPLOSION FELT AT HARVARD COLLEGE.

AT a meeting of the American academy of arts and science, held in Boston, Oct. 10, Prof. W. A. Rogers, of the Harvard college observatory, gave an account of his observations to detect any trembling of the earth at the time of the Flood Rock explosion. Professor Rogers stated that at 11:17:30 by the chronometer a very decided commotion of the surface of the mercury was observed. About 15 seconds later the rumble of an ice wagon was heard at a distance of 1,000 or 1,300 feet from the observatory. From this instant the effects of the disturbance by the wagon and of the explosion were combined, but the disturbance

waves from the latter cause were so greatly magnified beyond anything he had ever before observed that he thinks there can be no reasonable doubt of their reality as the result of the explosion. A second and still more violent commotion was observed 10 or 15 seconds later, and a third even greater disturbance occurred about the same length of time following the second. At 11:18:15 A. M., the entire surface of the mercury under the objective appeared to sway back and forth over a space certainly as great as one five hundredth of an inch. This action continued eight or ten seconds, and at the end of about 20 seconds there was almost an entire subsidence of the commotion. From this instant the recurring disturbances gradually diminished, and at 11:20 A. M. they had entirely ceased. At this time the ice wagon was directly opposite the observatory.

The waves of disturbance certainly increased in amplitude until 11:18:15 A. M., and gradually diminished after that time. The intervals between the waves appeared to be about 15 seconds, but attention was not withdrawn to the chronometer to be accurate as to this. Professor Rogers is not quite certain whether there were three or four waves preceding the one having the greatest amplitude. The direction of the waves as indicated by the movement of the spot reflected on the mercury surface, was certainly not due east and west, but rather about 15 degrees from the north and south line; that is, north of east and south of west. On the next following day, by prearrangement with the driver, an ice wagon was started from about opposite the observatory, to be driven rapidly away. Under these circumstances, only a very slight tremor of the mercury surface was visible, while the cart was traversing a distance of about 750 feet, after which the tremor ceased. The readings of the chronometer were corrected to give eastern time, as above stated.

SOCIAL PHILOSOPHY AND RELIGION OF COMTE.

THIS is one of the ablest works of the well-known author, and is a decidedly agreeable indication of the spirit just now prevalent in the better sort of philosophical discussion. When the British Hegelian movement began, a score of years ago, with Dr. Stirling's 'Secret of Hegel,' it was on its face an intolerant and exclusive movement. As popular English thought had no organ for understanding the master, and merely felt that Dr. Stirling had 'kept his secret,' so the Hegelian leader himself expressed a bitter contempt for popular English thought, and mutual advantage for the disputants seemed hopeless. The new Hegelianism looked like a new patent plan of salvation, with nothing to offer save to the faithful. Younger Hegelians in the British universities, equally learned in their chosen field, but less vain of their skill, have changed in latter days this forbidding exclusiveness. They have seen that a doctrine which pretends to be universal, cannot possibly be content with a merely scholastic intolerance and formalism. They have felt that if Hegelianism is of universal significance for human thought, it can be so only in case universal human thought is already in its actual essence, Hegelian, however unconscious the natural man may be of his discipleship. A system is of one sort when it says: "I express what you heretics shall become ere you shall escape from your natural and utterly lost state;" and of quite another sort when it says: "I express what you, as genuine human thinkers, already in your thought unwittingly are and aim to be." Now if there is any truth essential to genuine Hegelianism, it is that this latter attitude is the correct one towards the thought of any active and sincerely progressive age like the present. The Hegelian system pretends to have meaning only for an actual concrete world, and loses sense whenever it is presented as a remote plan of a purely abstract and ideal world. And so the healthy effort of the younger British Hegelians to drop Dr. Stirling's 'head-boy' airs, to cease boasting of the skill required for seeing through the Hegelian mill-stone, and to tell us a straight story about what human thought is and does, is an effort of a most gratifying sort. To be sure, this effort must not be confounded with any debased 'popularizing' of philosophical study, such as should overcome difficulties only by keeping them below the horizon. The more recent British Hegelian books and articles are not very easy reading. But they have a most stimulating air of actuality about them, and if Prof. Caird is not always so robust and direct in speech as some of his fellows, he at least shows a very sincere effort to continue his studious progress earthwards; and we may hope that he will ere long reach his goal.

This undertaking then, to show not that human thought must needs put on the Spanish boots of any man's terminology, but that the Hegelian doctrine has expressed profound truths about the unconscious spirit, and about the true meaning and work of all sound natural thought, is exemplified by Prof. Caird in the volume before us, by an application of his method to a criticism of Auguste Comte. Comte is, one would have supposed, at the other pole from Hegel. One would be amused to imagine them, in Walter Savage Landor fashion, engaged in conversation, or, better,

The social philosophy and religion of Comte. By EDWARD CAIRD, L.L.D. New York, *Macmillan*, 1885.

in Hades, like two characters in Lucian, possibly talking about this very book of Caird's, and vainly trying, with the tolerance suitable to disembodied spirits, to find out each what the other might be in the universe to do. They would hardly succeed so well as in this book Prof. Caird has succeeded for them. He has seen their close spiritual relationship, and has shown how much Comte's aim was like Hegel's. If in doing this he has rather delighted in reducing Comte to Hegel, than in trying to read Hegel in terms of Comte, the injustice, if it be such, is one natural to a disciple's nature, and also a necessary result of the fact that he has applied his criticism mainly to Comte's social philosophy. An equally thoughtful and tolerant Comtian critic, coming from his side with corresponding motives to the study of Hegel's *naturphilosophie*, would probably find no great difficulty in reducing whatever is significant in this part of Hegel to the terminology and to the thought of Comte.

But Prof. Caird is surely right in taking these two great thinkers to be expressions, unconsciously analogous, of the same great tendency. They both summed up the age of the reaction. In the temperaments of both smouldered the same repressed romantic fire, which each of them scorned in others, and could not destroy in himself. In each this same natural and suppressed sympathy with the romantic movement gave color to his results; each struggled with his temperament, and in each this struggle became his system. For philosophical systems, like all other products of devoted lives, are the results of inner personal conflicts of character. Hegel and Comte differed as Swabian from Frenchman; but their problems were much the same, and their results profoundly similar, beneath all the great external differences. Hence the concrete psychological interest of a book like the present.

There is no space here to go into the details of Prof. Caird's discussion. The book begins by pointing out the main elements both in the scientific and in the social philosophy of Comte. This part of the work is on the whole done very appreciatively. Then, in chapter ii., Prof. Caird begins his criticisms. Yet these criticisms are never merely destructive. The deeper sense of the doctrine is sought, and Prof. Caird easily finds, sometimes perhaps too easily, that where Comte was true to himself and to his problems, he was true also to essentially Hegelian principles. That Comte, for instance, in his hatred for what he called 'metaphysics,' stood in fact unconsciously on Kantian, and so on the Hegelian ground, is clear. That when Comte, after seeming to be a pure nominalist in his war with traditional religion and metaphysics, turns about and says: "Man is a mere abstraction, and there is nothing real but humanity," he comes upon decidedly Hegelian ground. "The defect," says Prof. Caird, "lies in the unconsciousness of his own metaphysic."

As chapter ii. is devoted to the negative or destructive side of Comte's doctrine, chapter iii. discusses the 'positive or constructive side,' including, in this, Comte's 'substitutes for metaphysic and theology.' Toward the end of the book, in chapter iv., on 'Comte's view of the relation of the intellect to the heart,' Prof. Caird seems to us to take his task too easily, and to content himself too frequently with inspiring but decidedly dark sayings. But here, very possibly, our failure to follow may be a matter of our own weakness in Prof. Caird's faith.

Prof. Caird's result assimilates very closely Comte's position in philosophy to that of Kant, namely, in so far as his thought was unconsciously, a germ out of which a positive idealism would have to grow if it were developed. "Also partly because he lived at a later time, and in the midst of a society which was in the throes of a social revolution, and partly because of the keenness and strength of his own social sympathies, he gives us a kind of insight into the diseases and wants of modern society, which we could not expect from Kant, and which throws new light upon the ethical speculations of Kant's idealistic successors." One has to believe, thinks Prof. Caird, that his system is 'inconsistent with itself' and that his historical and social theories are defective. But one finds him well worthy of study.

Let us add that one does not need to be an Hegelian in order to appreciate the skill and tolerance of Prof. Caird's book, and to find much that is deeply interesting, not only from a philosophic, but also from a purely psychological point of view, in this suggestion of strong mental and moral likeness under an external show of great diversity. In this sense, Prof. Caird has made a most helpful contribution to what we much need,—a psychological history of thought as a product of social and individual temperament.

RUSSIA UNDER THE TZARS.

READERS of 'Underground Russia' are familiar with the great fortress of Peter and Paul, famous as the place from which Krapotkine made his memorable escape, and they will recognize it here —not as an old friend—but as an old enemy. Not content, however, with a horrible description of the cruelties perpetrated in this place under the

Russia under the tzars. By STEPNIAK. Rendered into English by Wm. Westall. New York, *Scribner's Sons*, 1885. 12°.

sanction of the Czar's government, our author has shown us the interior of the other prisons to which political prisoners are sent, and has added a sketch of the life led by the suspects in exile. This occupies the middle of the volume, which opens with an account of the constitutional development of Russia—if it can be called development, when nearly all the movement has been backwards—and it is followed by a dry though useful description of the educational system of the country, written with a view to show its utter inadequacy. Stepniak, whose recent articles in the London *Times* on the present state of the Russian army are full of interest, possesses a talent for describing scenes of suffering and woe, which would have made his or her fortune if turned into the profitable channel of sensational novel-writing. But this same faculty prejudices his reader against him as the truthful narrator of scenes in actual life, and one puts the book down with a feeling that, after all, the author has been trifling with his sympathies.

JOHNSON'S SURVEYING.

THE method of ascertaining distances and elevations by means of the engineer's transit instrument and stadia—where the apparent length on a staff intercepted by two parallel wires in a telescope gives the distance of the staff from the instrument, and the vertical angle serves to determine the elevation—has not, as yet, become well established in private surveying practice, although no one who is well informed in such matters doubts its applicability to a large range of geodetic work, its accuracy and convenience.

The use of the stadia has been confined almost altogether to the U. S. and state surveys. The experience which Professor Johnson, of Washington university, St. Louis, gained while engaged on the surveys of the great lakes and the Mississippi River, has enabled him to prepare a very clear and concise manual of the operations of topographical surveying as there practised. He also gives a detailed description of the work of measuring a base-line and triangulating when the survey is of moderate magnitude, indeed for any work except the most important, and he explains the projection of maps for large and small areas.

The book is well suited to the class-room and the field. We should have preferred, however, to find his discussion of utility and universal applicability of the method placed in the introduction instead of the body of the text, or gathered into a note, for, when the reader is once assured of its reliability, he will be likely to feel that a manual is needlessly encumbered with such arguments.

A manual of the theory and practice of topographical surveying by means of the transit and stadia; including secondary base-line and the triangulation measurements and the projection of maps. By J. B. JOHNSON, C. E. New York, *Wiley*, 1885.

NEW BOOKS.

**** For full titles see 'Publications received at editor's office.'*

'Aid to engineering solution' (Jackson) is intended to correspond with 'Aid to survey practice,' and to afford a succinct account of a simple general method of effecting engineering solutions, as well as to give a complete set of solutions useful to the engineer.——'Commercial organic analysis' (Allen) is the first volume of a revised edition, devoted chiefly to the consideration of bodies of the fatty series and of vegetable origin, and includes chapters on alcohols, ethers, and other neutral derivatives of the alcohols, sugars, starch and its isomers, and vegetable acids. The second volume is already on the press, and treats more especially of coal-tar products and bodies of the aromatic series, the fixed oils, and the products of their saponification; and the tannins will also be considered. It is proposed to devote a third volume to nitrogenized organic substances.——'Henfrey's English coins' (Keary) is a new edition of Henfrey's 'Guide to English coins,' with some corrections and enlargements, without any decided alterations in the form of the book.——'Silos for British fodder crops' (*The field*) is a third edition, the same as the last excepting that 48 pages have been appended to supply particulars respecting the ensilage competition of 1884.——'Mikroskopische reactionen' (Holtzendorff) is an attempt to bring together, for the use of chemists, reactions based on the crystalline form and optical qualities of substances, which can be used under the microscope.——'Spezial-karte von Africa' (Habenicht, Domann, and Lüddecke). This map, published by Justus Perthes in Gotha on the occasion of the centennial of the foundation of that house, is being made under the direction of Hermann Habenicht, Bruno Domann, and Dr. Richard Lüddecke. It will be published in ten parts on a scale of 1: 4,000,000.

GEOGRAPHICAL NOTES.

CHAFFAUJON writes from Ciudad-Bolivar of his recent journey to the upper Orinoco and Cauca rivers. He was accompanied by Indian guides, two from the Arigua tribe, an Arebato and a Guagnungomo, the latter belonging to a tribe feared for its valor and ferocity by all the people of the region. The party passed without difficulty as far as a little village near the Brazilian frontier, where

the Guagnungomo disappeared. This put the traveller on his guard, but, while rifling a burial place of the same tribe, he was suddenly attacked by a party of them, led by his former guide, who shot the Arebato fatally, but failed to wound Chaffaujon. The latter killed the renegade, whose companions disappeared, but carried or drove off all the animals and equipment of the party, as well as one of the Ariguas. With the other, however, the traveller escaped and reached the Cauca, which he descended on a raft to Tremblador, where the authorities had arrived with a military party in search of him. It would seem that it was his intention to return to Europe before long.

The U. S. revenue cutter Corwin arrived in San Francisco from the arctic, October 12. She brought with her the party sent out by General Miles last year to explore between the Copper and Yukon rivers. They were Lieut. H. F. Allen and Sergeants Robertson and Ficket of the Army signal office. They had crossed from the headwaters of the Atnah River to those of the Tananah, descended the latter to the Yukon, and the Yukon to the sea, accomplishing a most creditable journey, and one which a previous military party under Lieut. Abercrombie had failed to carry out. A considerable part of it was over an unexplored region. Messrs. Garland and Beatty, two English travellers who had crossed from the Mackenzie to the Yukon and descended the latter, were taken up with the American party at St. Michael's and brought to San Francisco. The Corwin also brought the crews of the Napoleon, the George and Susan, and the Mabel, three whalers lost this season in Bering Sea and the arctic. We have referred previously to the loss of the Napoleon; the two others appear to have been blown ashore in a gale, August 10, near Wainwright inlet, in latitude 70°. Three of the crew of the George and Susan were lost, but the catch of oil and bone was saved and brought down by the bark Ohio. The Corwin party themselves have accomplished some creditable exploring work during the season. Lieutenant Cantwell returned to his explorations of the Kowak River, while Asssistant engineer McLenegan, his companion in 1884 (*Science* No. 98, p. 551), undertook the exploration of the Nunatok, or Noatok, River, a stream falling into Hotham inlet, near and west from the Kowak, and so far less known than the latter. The Inland, or Noatok, River had been supposed to be a more important stream than the Kowak until the investigations of Cantwell and Stoney threw a doubt on the matter. Stoney's party, whose preparations for wintering we have already noticed, sent a mail down by the Corwin, which left them near the head of Hotham inlet. The explorations of the present year were entirely successful, and will be referred to again when details have been received.

Thoroddson contributes to *Globus* an account of his explorations in Iceland in 1884, which is more full and precise than the notes previously published. It appears that in a journey of ten weeks over the Odádahraun desert and the adjacent mountains, about one-half was passed in an uninhabited region, much of which was completely unknown. He forced his way along the northern base of Vatna Jokull, the journey being frequently hazardous and always laborious. Many corrections of heights were made, and it seems that Jökulsa, which has been taken as the longest Icelandic river, is exceeded by Thiörsa, which is some 120 miles in length. An ascent of the unvisited and important Dyngja volcano was made. It proved to have a double crater, the inner one being 600 feet or more in depth.

The autumnal exodus of the fleet from Alaskan and arctic waters brings letters and successive mails with a profusion which contrasts strangely with the one opportunity of midsummer or the want of any opportunity from October to March, west of Mt. St. Elias. The sealing schooner San Diego, which has had a thrilling history in Alaskan waters and was thought to have foundered this fall in a severe gale, has reported in good order. The coast survey steamer Patterson, which has been surveying in Alaskan waters during the summer, has put in to San Francisco, having encountered heavy gales on the way down. The whalers are reporting, after an unusually successful season; the first to appear being the Coral with 1,600 bbls. of oil and 16,000 pounds of whalebone. She brought a slab of baleen from the Alaskan right whale, captured off Kadiak, and now very rare, which excited the astonishment of old whalers. It was only six feet long, but weighed nine hundred pounds, and is said to be the heaviest on record from the Pacific. According to advices from Kadiak, of Sept. 22, that flourishing village of St. Paul had not to that date seen or heard anything official of the existence of the supposed territorial government, instituted nearly two years ago. No revenue cutter had visited them for three years, although this is the port of third importance in the territory, with a good commerce and boasting a deputy collector of customs. The salmon canning had ceased for the season; owing to the low price of fish, but 60,000 cases of salmon and boneless codfish had been put up, with about 1,000 barrels of salt salmon and a certain amount of smoked halibut. Reports from the other fishing stations and the outlying trading posts had not been received, but the harvest of furs and sea-otter skins was an excellent one wherever heard

from. Wreckage of oriental origin, including part of a vessel's rail with a money box cut into it and containing some Chinese coins, had been picked up on the shore of Montague Island, Prince William Sound. The season at Kadiak had been a fine one, the crop of potatoes and especially of cauliflowers being very successful, but at Iliamna trading station, Cook's Inlet, a freshet occurred during the summer, by which the course of a small stream was changed and the trader's house actually washed away. A gale in July at Cold Bay, on the peninsula, caught a sea-otter party of Aleuts far from land in their kayaks, and for forty-eight hours they were obliged to use their paddles to keep from foundering. Five were drowned. The volcano of St. Augustin in Cook's Inlet continues to emit smoke and steam from many fissures. Water is still very scarce there, but several white otter hunters have established themselves upon the island for the winter. In southeastern Alaska the Treadwell or Paris mine is proving a great success. The new mill, numbering 120 stamps, sent down $95,000 as the result of the first twenty-five days' work, and there is an almost unlimited quantity of low grade ore milling, net, about $5.00 to $8.00 gold per ton. This has stimulated work on the gold mines near Sitka, which are much richer but less extensive.

ASTRONOMICAL NOTES.

Meeting of the Astronomische gesellschaft.—*Nature* (xxxii., 516) gives a rather full account of the meeting of the Astronomische gesellschaft held at Geneva, August 19–22. Among about fifty members present we see the names of Struve, Newcomb, Christie, Auwers, Krueger, Tisserand, Weiss, and Schoenfeld. Reports were read on the present state of the computation of planetary orbits, on the zone work of the society, and on the photographic mapping of the stars of the Bonn *Durchmusterung* begun by Gill at the Cape. Professor Auwers read a paper by Professor Pickering on the photometric survey of the heavens, which was heard with especial interest; and Staatsrath Struve, in presenting photographs of the Pulkowa 30-inch refractor, expressed his complete satisfaction with the instrument. On the last day of the meeting addresses were made by Professor Gyldén on the graphic representation of planetary orbits, by Professor Newcomb on perturbations and their numerical calculation, and by Dr. Mueller on modern photographic apparatus. Other papers were read by Professors Bakhuyzen, Seeliger, Safärik and Weiss. The subject of most general immediate interest was the discussion of the sixth resolution of the Washington meridian conference, recommending a change in the beginning of the astronomical day. Struve, Folie and Pechüle seemed to be the only members in favor of the change, while Newcomb, Weiss, Krueger, Dunér, Auwers, Tietjen and Safärik, spoke in opposition to it. Professor Gyldén thought it inexpedient to make the change at present, though he was of the opinion that, in twenty or thirty years hence, the majority of astronomers would be in favor of a universal time. The statement by Struve that in the Royal astronomical society the majority are in favor of the universal time, has been corrected by Mr. Downing of the Greenwich observatory, who says (*Nature* xxxii., 353) that "the Royal astronomical society as a body has not expressed any opinion on the subject. And judging from the individual expressions of opinion which have been published, I should imagine that here, as at Geneva, the majority of real workers in our science (with the probable exception of those engaged on solar work) would be opposed to the proposed change." No resolution in regard to the matter was passed by the gesellschaft. The next meeting will be held at Kiel in 1887.

Displacement of solar lines.—In order to obtain, if possible, further evidence upon the disputed question as to whether the displacements and distortions of lines in solar spectra are due to actual drag of masses of gas to or from us, sometimes calling for velocities of 400 or 500km. per second, M. Trepied proposes, in the *Bulletin astronomique* for August, an arrangement of apparatus by which, after the light has passed through slit and collimator, the beam shall be divided so as to show two spectra superimposed at any desired point of either, thus allowing simultaneous optical examination, or micrometrical measurement, upon two lines from exactly the same part of the sun. He then proposes to test Fizeau's law that the ratio of displacement to wave-length, $\frac{\Delta\lambda}{\lambda}$, should be constant throughout the spectrum, for any one velocity of the luminous source to or from us. He will begin with the C and F lines of hydrogen, the ratio of whose wave-lengths is about 1.35 to 1.00. It would seem as if this difference should show plainly in the relative displacements, but it must be remembered that the largest of these take the form of very irregular distortions of the lines, and the different brightness and color of the lines and their background may perhaps differently affect their visible or measurable limits. His results will be awaited with interest.

Parallax of 40 o^2 Eridani.—Professor Hall publishes, in No. 2682 of the *Astronomische nachrichten*, the results of observations made in 1883 and 1884

to determine the annual parallax of the star 40 o^2 Eridani. The principal star of this system has a proper motion of 4″ a year; and, at a distance of 82″, there is a double companion, which has the same proper motion, while nearly between them is a small star which does not move. Professor Hall finds for the parallax of 40 Eridani

$$\pi = 0''.223 \pm 0''.0208.$$

a result rather smaller than might have been expected, but one which he considers worthy of considerable confidence.

Comet Tuttle (1790 II.).—Swift reports having found the comet on August 13. He describes it as "fairly bright on a dark sky, and shows a strong condensation at the centre." As far as we have learned, he is the only one who has seen the comet at this return, except the astronomers at Nice.

The nebula in Andromeda.—The new star in the Andromeda nebula continues to decrease in brightness. On October 10 it was estimated as 9.9 magnitude with the transit circle of the U. S. naval observatory. This estimate depends upon the same star used in the previous observations (*Science* vi., 310).

Comet 1881 III (*b*) Tebbutt.—Dr. de Ball intends to compute the orbit of the above comet, and calls for any observations still unpublished. Address, 'Dr. de Ball, Observatoire, Ougrée, Liége, Belgium.'

NOTES AND NEWS.

THE curriculum of the University of Michigan has been altered and enlarged in order to provide a specific course of study for students who wish to devote their time largely to biological work, either as a preparation for the study of medicine or with a view to teaching or engaging in biological research. Zoölogy, botany, and physiology are the most prominent subjects of the course, but full opportunity is given for extended work in physics, chemistry, paleontology, and other sciences.

— The first one of a course of ten lectures on physiology and hygiene, under the auspices of the Cincinnati society of natural history, was given on October 3. These lectures are free to teachers of the public schools, and the interest is shown by the application of about seventy-five teachers for tickets to the course. This is the second course given by the society, the first having been on botany.

— Cable dispatches announce the death of Thomas Davidson, preëminently the British student of Brachiopoda. He was born in Edinburgh, May 17, 1817, and received most of his education on the continent. A review of his latest work will be found in *Science* (v., 409). The monograph of recent Brachiopoda, there referred to as in preparation, has actually been completed. Under date of June 1, in a letter to a friend in this country, which we have been permitted to see, he says that it will be accompanied by 30 plates, containing 865 figures, and adds: "I can assure you that this work has taken me a long time to complete, and, since I have been ill for several months, it is fortunate that all is ready to send to the printer. I have thus been able to bring to successful conclusion all that I had proposed to accomplish, and I am now ready to leave this world as soon as God wills." This indefatigable investigator adds that he has also completed a bibliography of the Brachiopoda which will occupy about 200 quarto pages and contain about 3400 titles; the first part will be printed by the Palæontographical society this year and the balance in the volume for 1886. "I have been able," he concludes, "to make a very rich and nearly complete collection of recent Brachiopoda, and I propose to bequeath the whole of this, as well as all my fossils, to the British museum."

— James Macfarlane, well-known for his useful 'Geological railway guide' and 'Geologist's travelling handbook,' died suddenly on the 12th instant at his home in Towanda, Penn., of heart disease. He was born Sept. 2, 1819, at Gettysburg, Penn.

— In the *Philosophical magazine* for August, Shelford Bidwell, Esq., in a paper entitled 'The sensitiveness of selenium to light and the development of a similar property in sulphur,' describes a series of very interesting experiments, which would seem to show that the action of light in varying the resistance of a selenium cell arises from the fact that the conductivity of the cell is due to a selenide of the metal with which it is annealed (the crystalline selenium itself being practically a non-conductor), and that the formation of this selenide is assisted by direct radiation of light. With sulphur and silver he formed cells showing the same variation of resistance in light and darkness, and showed very plainly that the union of sulphur and silver into the sulphide, at ordinary temperatures, is greatly assisted by direct radiation, and is not due to rise of temperature of the substances themselves. The whole analogy of the actions of sulphur and selenium in the two cases, coupled with the enormously high resistance of pure selenium when crystallized between glass plates or substances with which it does not combine, seem to render his conclusions highly probable. The whole paper is of great interest.

— The Russian government has just despatched one of the foremost mining authorities of the day, M. Gulishambaroff, to Askabad, in Central Asia,

to investigate the mineral treasures of the region. M. Gulishambaroff has made his name principally in writing on petroleum, which will be one of the subjects of investigation ; but the sulphur deposits of the Turcoman desert are his main object. Specimens of fine iron ore have also been sent in from the Akhal oasis, and the extent of this is to be reported on. The Herat territory, which is contiguous to the new Russian acquisitions, is rich in minerals.

— The new Institute of hygiene founded in connection with Berlin university, and presided over by Dr. Koch, is so far advanced towards completion that lectures will be held in it this term. It is principally intended for the study of bacteriology.

— Prof. O. C. Marsh, of New Haven, discussed the size of the brain in extinct vertebrates before the British association recently ; this is a subject which has engaged his attention for fifteen years. In every instance he found that the mammals from the lower tertiary had very small brains. He carried out his investigation into the upper tertiary, and found that the brain was much larger in the pliocene than in the miocene. All the tertiary mammals had small brains ; there was a gradual increase in the size of the brain during this period ; and this increase in the size was generally in the cerebral hemisphere or higher portions of the brain. In some groups the convolution of the brain had gradually become more complex. In some the cerebellum and the olfactory lobes had even diminished in size. There is now evidence that the same general law of brain growth holds good for birds and reptiles from the Jurassic period to the present time. The brain of an animal belonging to a vigorous race fitted for a long survival was larger than the average brain of that period in the same group ; and the brain of a mammal of a declining race was smaller than the average brain of its contemporaries of the same group. The small animals now existing had proportionally larger brains than the larger animals, and young animals had proportionally larger brains than adult animals. They found some interesting examples which threw light on this question. For instance, in the eocene they had an animal, the oldest known ancestor of the rhinoceros, and it had an exceptionally large brain. Taking all the facts together, it seemed as though this brain growth was an important element in the survival of animals. If the animal became large and unwieldly with a small brain, it would be liable to suffer from any change of climate. In other words, in early times the big brain conquered, as it is the big brain that conquers in civilization to-day. In the discussion which followed the paper, Professor Flower said it was satisfactory to find a case where the facts worked out coincided with previously-formed theories, because that was not always the case, and sometimes the facts or the theories had to go to the wall. In this case they had no such difficulty, and they had to thank the American government for the way it had taken up Professor Marsh's work and was disseminating it.

— A very convenient summary of the results obtained by the English society for psychical research and the tendency of their work is to be found in an article by Grace Peckham, M.D., entitled, 'A critical digest of the proceedings of the English psychical society.' It is published in the *Journal of nervous and mental disease* (New York) for July, 1885 (published in September).

— The Columbia college philosophical society is to be revived this winter. It was organized in 1882, and during that and the following winter held monthly sessions of much interest. Papers were read by Prof. Archibald Alexander, Prof. G. Stanley Hall of Johns Hopkins university, Prof. William M. Sloane of Princeton, Dr. Nicholas Murray Butler, Dr. Edward W. Hopkins, and others. The average attendance at these meetings was fifty, and an even larger attendance is hoped for this winter.

— The English and American societies for psychical research may receive some coöperation from the Société de psychologie physiologique just started in Paris. This society purposes making a study by observation and experiment of all phases of psychical activity, both normal and pathological. M. Charest is the first president, and MM. Janet and Ribot the vice-presidents of the society,

— The Russian papers announce that the section of the Transcaspian railway from Kizil Arvat to Askabad is almost complete, and that it may be expected to be formally opened at an early date. They are also asking whether the line is to stop at Burdalik, its ultimate destination on the Amu Daria, or whether it is to be carried beyond that place. A commission, composed of members of the different departments, has been appointed to investigate the subject.

— The portrait of Prof. Louis Agassiz, in our last number, was drawn by Robert Lewis from a large photograph by Sonrel, taken about 1865. Sonrel, it will be remembered, was an artist in the employ of Professor Agassiz, who afterwards, from failing eyesight, turned his artistic skill into the photographic field. The larger part of the plates in Agassiz's 'Contributions to the natural

history of the United States' were drawn from nature on stone by Sonrel.

WASHINGTON LETTER.

THE Chemical society, although one of the youngest, is by no means the least active of the scientific societies of Washington; in fact it will take a relatively high rank in that respect. It is presided over by Professor F. W. Clarke and its members number about forty. The first meeting for the season was held on the evening of the 8th of October. It happened that both the president and secretary were absent, but there was a good attendance of members and an interesting meeting was held. Mr. Chatard gave an informal account of his recent examination of the leading salt works of the country, together with a general discussion of the manufacture of salt in America. Mr. Chatard has been engaged for some time under the U. S. geological survey in the study of this question, especially with a view of determining whether any practical use can be made of the great alkali deposits which are so abundant in the United States, and it is likely that the subject will occupy his attention for some time to come.

It has sometimes been found difficult to provide interesting material for the 'first meetings' of societies here, for the reason that many of the active contributors to their proceedings have just returned from their summer campaigns and have had no leisure for working up the material which they have accumulated. The Chemical society was this year an exception to the rule and so, also, was the Philosophical society, which held its first meeting on the evening of Saturday, the 10th of October. Dr. Billings had provided an interesting programme in the exhibition and discussion of a large and valuable collection of anthropometric apparatus recently received at the Army and navy medical museum. A large part of it was a duplicate of what had been used by Galton in his laboratory, and a very interesting part had been manufactured in Germany by Mr. Cattell. It was understood that the latter involved some improvements on forms devised by Mr. Stanley Hall for the investigation of the time occupied in certain simple mental processes. By means of a sort of drop shutter, somewhat resembling a guillotine, the subject upon whom the experiment was being made was permitted to see for only an instant the object, the nature of which he was to determine as quickly as possible. The thing to be seen may be a card of a particular color, the subject being required to decide what color it is, or but two colors may be used and he may be required to decide which of the two appears. Diagrams of different forms may be used, and the time occupied in judgment of form determined. Cards with various numbers of well defined dots on them may also be displayed, and the subject required to announce the number as determined from his instantaneous view of the card. In this way something may be known in regard to the maximum number of individual objects which one recognizes, or can correctly announce, without the operation of counting. It was stated that experiments conducted in this manner gave three as this maximum, which is certainly less than the result obtained by a different mode of experimentation. The apparatus was arranged to register the time intervals by means of a Hipp's chronoscope. Considerable discussion resulted from the exhibition of the instruments, and the use of a Hipp's chronoscope was criticised by several members. It is unquestionably complicated in its form and requires a good deal of skill and experience in its use. There are several modern methods of time measurement for small intervals which appear to excel it in simplicity of construction, ease of operation, and accuracy of performance. So much interest was manifested in this discussion that it was found necessary to postpone a paper on psychrometry by Mr. H. A. Hazen, which was on the programme for the evening, and it will be taken up at the next meeting.

Lieut. Cornwall of the Bureau of navigation, in charge of the 'division of compasses,' has gone to Mr. Roach's ship-yard at Chester, Penn., to make experiments on the magnetic constants of the new steel cruisers, Boston, Atlanta, and Chicago. The last is still unfinished and as its azimuth has been constant for some months, the investigation of its magnetism now, and again after launching, will doubtless be of much interest.

Within the past week the capital has been visited by Mr. Clements R. Markham, secretary of the Royal geographical society of London. His stay in the city was necessarily short, and he was unable to visit all of the centres of scientific activity in the city; but his brief visit was much enjoyed by those who had the pleasure of making his acquaintance.

Not everybody is aware of the interest which Professor A. Graham Bell has long taken in the instruction of deaf-mutes, or that he has for some time maintained an 'experimental' school for deaf children in this city. Mr. Bell has recently taken a very important step in the organization of a normal or training school for teachers in connection with this school for children. He is desirous of training young ladies who are thoroughly interested in this work, in the methods which he has devised, tested, and approved for instructing deaf-mutes, and especially in the methods of teaching

articulation, upon which subject Mr. Bell has bestowed a vast deal of time and study. But a limited number of teachers in training can be accommodated, and the opportunity is doubtless one which will be eagerly sought.

The national museum, Mr. Barnum, and the big elephant Jumbo, have all received a good deal of public notice arising from the singular death of the gigantic and lamented beast. The public was at first assured that the bones of this creature, fated to disturb two continents, were to rest in the national depository, although it was stated that the stuffed skin was to adorn the collection of a New England college. Recent information, however, seems to indicate that Mr. Barnum has awakened to the fact that he now has two Jumbos, instead of one, and that both may continue to be sources of profit for some time to come as parts of one or two travelling 'aggregations.' There is little doubt but that a year or two of this sort of an existence would greatly diminish the value of the skeleton of the elephant, and it is stated that the director of the national museum is in correspondence with Mr. Barnum with a view to prevent such a calamity, in which effort everybody wishes him success. Reference was made in the letter of two weeks ago to the large acquisitions of the museum through the New Orleans exposition. The curators of the various departments are getting some of these collections into shape, and although they are in some instances embarrassed by lack of space, some effective displays will be made. A very valuable, and, in some respects, typical collection was presented by the Japanese government, and has just been unpacked. It is intended to present an epitome of the arts and industries of the country, and as such it will doubtless be kept together for some time, and conspicuously displayed. It includes illustrations of the handicraft of the ingenious natives of Japan in pottery, porcelain, lacquer, bronze, silver, and copper, and also models and water-color sketches illustrating Japanese fisheries, domestic occupations and the like. Z.

Washington, D. C., Oct. 19.

LETTERS TO THE EDITOR.

**** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

An attempt to photograph the corona.

Mr. W. H. Pickering having courteously sent me a copy of *Science* (August 14), containing an article entitled 'An attempt to photograph the solar corona without an eclipse,' may I ask you to insert the few lines which follow in the next number of your journal?

Passing by all those points which are covered, directly or indirectly, by my reply to Mr Pickering's first letter (*Science*, April 3), I find only two matters which I consider it necessary to notice.

1. Mr. Pickering says: "The inferiority of the best gelatine plates to the human eye in this respect [small differences of light] is very readily shown by an attempt to photograph distant mountains." He then goes on to say: "Another illustration of the same thing is the impossibility of photographing the moon in the daytime, when the sun is high above the horizon. Although the moon may be perfectly distinct to the eye, the negative shows no trace of it."

To your scientific readers, the reasons will readily suggest themselves, why, in the case of the moon in the daytime at some angular distance from the sun, the eye has an advantage over the plate, while, in the case of the corona, the plate has a great advantage over the eye. Apart from any such considerations, as a matter of fact, *there is no difficulty in photographing the moon at noonday.* Yesterday I took, with the apparatus used on the corona, four negatives on bromide plates (Edward's), between 11.30 A.M. and noon, in full sunshine. On all the plates, the moon is very distinct and well-defined. The moon at noonday, unless too near the sun, is an easier object to photograph than the corona. It is obvious, therefore, that photographic methods, which are not delicate enough for the moon, must utterly fail if applied to an object still more difficult, as the corona undoubtedly is at ordinary elevations.

If Mr. Pickering's statement of the 'impossibility' of photographing the moon under the conditions already named, rests upon his own experiments, some light may come upon a point which has occasioned me surprise, namely, that Mr. Pickering does not appear to get upon his plates the defects of his own apparatus; for example, those of the position of his shutter and those of his spectacle lens. In some experiments I made with a shutter similarly placed, very strong diffraction effects appeared on the plates, effects stronger than any photographic action which could be supposed to be due to the corona.

2. With regard to Mr. Pickering's experiments, I would point out that the conclusion to which they lead him, namely, "It therefore seems that even in the clearest weather the reflected light of the atmosphere is 300 times too strong to obtain the faintest visible image of the true coronal rays," appears to me to be irreconcilable with the direct observations of Professor Langley and others of the planets Mercury and Venus, as black disks before they reach the sun. Professor Young says: "Of course this implies behind the planet a background (of corona) of *sensible* brightness in comparison with the illumination of our atmosphere." (The sun, p. 229.)

The Bakerian lecture read recently before the Royal society, in which I have discussed some of these points more fully, will be in print in a few weeks. The photographic method is now being tried at the Cape of Good Hope, under the scientific conditions I have pointed out as essential, by Mr. Ray Woods, under the able superintendence of Dr. Gill, F.R.S. WILLIAM HUGGINS.

From the above interesting communication by Dr. Huggins I regret to find that he has failed to see my reply published in *Science*, for April 29, to his letter of April 13. My experiments on the position of the drop-shutter were there taken up with some detail. Also other points presumably referred to in the beginning of his article are discussed.

As to the observations of the planets Mercury and Venus, as black disks before they reach the sun; the

explanation usually given [1] of this phenomenon is that it is due to the refraction of the sun's rays passing through their atmospheres, and thus illuminating rather more than one hemisphere at a time. Any small body surrounded by a ring of light would naturally appear darker by contrast than the surrounding background.

In regard to photographing the moon in the daytime, it may be as well to call attention first to the fact, that as the moon and sky are nearly of the same brilliancy, and there are accordingly no irradiation effects, it is not a question of the best form of apparatus, but almost entirely of the contrast qualities of the plate and developer employed. In fact an ordinary camera furnished with a long focussed landscape lens is as good an instrument as can be devised for this investigation. Fortunately I had on hand some of Edwards's bromide plates, imported last June, and they, together with some Carbutt B. and Anthony chloride plates, were employed in the following determinations.

It should also be stated in regard to my remark, reading "the impossibility of photographing the moon in the daytime, when the sun is high above the horizon," that this was merely a general statement, founded on observations made in June and July when the sun's altitude in the middle of the day was between 60° and 70°.

Dr. Huggins has now shown that this statement is not rigidly exact, as with the sun at an altitude of 35°, and the moon in the most favorable position at this season (the third quarter), he has obtained a distinct image upon his plates. I repeated his experiment, October 16 and 17, when the moon was in the first quarter, and with the sun at an altitude of 18° obtained a similar result. The images, though distinct, were far too faint to print, and only two plates out of nine showed any image at all, although the moon was very conspicuous to the eye. I should consider it doubtful if photographs of the moon could be obtained with the sun at an altitude of over 60°. If then there is difficulty in obtaining an impression of the moon at 90° distance from the sun, how much more difficult would it be to photograph the still fainter coronal rays, when masked by the dazzling brilliancy of our atmosphere in the sun's immediate neighborhood.

But what particularly interested me in Dr. Huggins's communication was, that I saw at once that it furnished me a new constant, and accordingly a new method, for determining the relative light of the atmosphere near the sun, and the corona. Five separate measurements were made between 1.15 and 4.15 on October 16 and 17, of the relative light of the sky in the immediate vicinity of the sun and moon, by the photographic method described in a previous paper.[2] These ratios varied from 16, when the sun was highest, to 50 at the later hour. Taking the average of these values, we may safely assume that between three and four o'clock, when my successful pictures of the moon were taken, the light about the sun is generally not far from 35 times as bright as the light of the sky in a region where it is just possible to photograph the moon. But according to the observation of Prof. S. P. Langley, previously quoted, the light of the moon is ten times that of the corona at 3′ distance from the sun. Accordingly the light of the atmosphere in the immediate vicinity of the sun would have to be reduced 350 times in order to obtain an impression of the corona upon our plates. If the sun were at a greater altitude, this figure would be somewhat smaller. The value found by my previous experiments was 320. The closeness of the coincidence is probably accidental, but of the two methods the first one seems to me rather the more accurate.

WM. H. PICKERING.

[1] Newcomb's Astronomy, p. 299. [2] *Science*, Aug. 14.

Voss-Holtz electrical machine.

In response to Mr. Eaton's communication in *Science*, No. 141, I would say that, about a year ago, I compiled for one of my classes a discussion of the Voss-Holtz electrical machine. Some months afterward Mr. E. B. Benjamin prepared a pamphlet regarding his machines, and asked my permission to incorporate what I had given my students regarding the theory of these. I granted his request, though not satisfied with the completeness of the discussion. What I had written had not been intended as a contribution to science, and I did not deem it of sufficient importance to quote authorities. Before putting my compilation on paper, I had consulted Ferguson, Silvanus Thompson, Ganot, Desehanel, some articles by Dr. Atkinson of Chicago, and the article in *Science* by Mr. H. W. Eaton. I cheerfully express my obligation to all of these writers. Mr. Eaton's article was specially helpful. As I claimed no originality, there was no attempt or wish to deprive him of any credit due.

The greater part of Mr. Benjamin's pamphlet was written by himself. W. LE C. STEVENS.

Brooklyn, Oct. 19.

Recent Proceedings of Societies.

Academy of natural sciences, Philadelphia.

Botanical section, Oct. 12.—Mr. Aubrey H. Smith described the flowering of Gordonia pubescens in Bartram's garden and gave a history of the species.—Mr. John Redfield spoke of the topographical features of Martha's vineyard and Nantucket, in connection with the flora of those islands. The northern part of the former rises into rounded gravelly hills of considerable elevation, composed of gravel drift, with occasional large bowlders. They are evidently of glacial origin. The more central portion consists of level plains of gravel covered with oak, mostly Quercus obtusiloba. The general character of the flora is much like that found on the summit of the divides in southern New Jersey, though much more limited as to species. Farther south, extensive ponds both of fresh and salt water introduce their characteristic vegetation. In Nantucket he had found the gravelly hills of much less height, the greater portion of the island consisting, in fact, of treeless plains. One extensive grove of Pinus rigida exists in the central portion, and is known to have been planted. The most characteristic plants of the plains seemed to be bear-berry, Arctostaphylos uva-ursi, which grows there in great profusion. The two species of Hudsonia abound, the Hericoides being seen everywhere, and less frequently the bluish tufts of H. tomentosa, Polygalae polygama, Myrica, cerifera, and various vaccinæ abound. He saw many large patches of Corema Conradii, the existence of which in Nantucket had first been made known by Mrs. Owen of Springfield, Mass. But the most inter-

esting feature of the Nantucket flora is the existence of three species of heath under circumstances that lead to the belief that they are indigenous. Mr. Redfield has not seen the locality of Colluna vulgaris, but had seen that of Erica cinerea. The latter has been known and watched for ten or twelve years and is evidently long established. It grows in the open common, far away from the town, and there is nothing about its surroundings to indicate human introduction. It covers only a space of eight inches by ten. Since Mr. Redfield's visit he had learned that another and possibly a third locality of heath had been discovered widely distant from the first, and that in one case the species proved to be Erica tetralix. He held that the discovery of so many species, and these the same as are found associated in England, pointed strongly to an indigenous origin. Mr. Meehan in continuation described the associated growth of the three species of heath on the Isle of Wight.

Calendar of Societies.

Philosophical society, Washington.

Oct. 10.—Drs. J. S. Billings and Washington Matthews, Exhibition of anthropometric and reaction time apparatus.

Society of arts, Boston.

Oct. 22.—Mr. W. W. Jacques, Recent progress in underground wires.

Boston society of natural history.

Oct. 21.—Dr. S. Kneeland, Two memorial gravestones of the iron age, from central Sweden, bearing Runic inscriptions and other symbols.

Natural history society, Agricultural college, Mich.

October meeting.—Election of officers: G. W. Park, president; F. C. Davis, vice-president; H. L. Chapin, secretary; L. G. Carpenter, treasurer; W. H. Clemons, curator. Chairmen of sections: Agriculture, Prof. S. Johnson; astronomy, L. G. Carpenter; botany, Dr. W. J. Beal; chemistry, F. S. Kedzie; scientific method, Prof. L. McLouth; zoölogy, Prof. A. J. Cook.

Oct. 11.—J. B. Cotton, Parasites of Pieris rapae; W. G. Everhart, Contents of a drop of water; W. K. Clute, Unconscious bias in walking; A. B. Sudworth, A talk about mosses.

Publications received at Editor's Office, Oct. 12–17.

Balling, C. A. M. Die metalhüttenkunde. Berlin, *Springer*, 1885. 22+627 p., illustr. 8°. (New York, Stechert, $5.70)

Barus, C. and **Strouhal**, V. The electrical and magnetic properties of the iron-carburets. Washington, *Government*, 1885. (Bull. U. S. geol. surv. 14.) 238 p., illustr. 8°.

Beckert, T. Leitfaden zur eisenhüttenkunde. Berlin, *Springer*, 1885. 8+416 p., 3 pl., illustr. 8°. (New York, Stechert, $3.30.)

Benoit, M. J. R. Construction des étalons prototypes de résistance électrique du ministère de postes et des télégraphes. Paris, *Gauthier-Villars*, 1885. 80 p. 4°. (New York, Christern, $1.50.)

Bichat, M. E. et **Blondlot**, M. R. Instruction á l'étude de l'électricité statique. Paris, *Gauthier-Villars*, 1885. 10+141 p., illustr. 8°. (New York, Christern, $1.35.)

Bohn, C. Die landmessung. Heft i. Berlin, *Springer*, 1886 (1885). 436 p., illustr. 8°. (New York, Stechert, $4.40.)

Brongniart, C. Les insectes fossiles des terrains primaires. Rouen, *impr. Lecerf*, 1885. [24 p.], 5 pl. 8°.

Chevallier, A.-F. et **Muentz**, A. Problèmes de physique avec leurs solutions développées. 2d ed. Paris, *Gauthier-Villars*, 1885. 8+205 p., illustr. 8° (New York, Christern, $2.)

Congres géologique international, 3ième session, Berlin, 1885. Membres présents. Berlin, *Sittenfeld, pr.*, 1885. 9 p. 8°.

Curtius, G. Zur kritik der neuesten sprachforschung. Leipzig, *Hirzel*, 1885. 161 p. 8°. (New York, Stechert, $1.)

Delbrueck, B. Die neueste sprachforschung. Betrachtungen über Georg Curtius shrift zur kritik der neuesten sprachforschung. Leipzig, *Breitkopf & Härtel*, 1885. 49 p. 8°. (New York, Stechert, 40 cents.)

Doolittle, C. L. A treatise on practical astronomy, as applied to geodesy and navigation. New York, *Wiley*, 1885. 10+642 p., illustr. 8°. $4.

Faye, H. Sur l'origine du monde. Théories cosmogoniques des anciens et des modernes. 2d ed. *Gauthier-Villars*, 1885. 12+309 p., illustr. 8°. (New York, Christern, $2.)

Forel, F. A. La formule des seiches. Geneve, *Arch. sc., phys. nat.*, 1885. 12 p. 8°.

Gieseler, E. A. On tidal theory and tidal predictions. Philadelphia, *Frankl. inst.*, 18×5. 61 p. 8°.

Gretschel, H. and **Bornemann**, G. Jahrbuch der erfindungen. Leipzig, *Quandt & Händel*, 1885. 6+405 p., illustr. 12°. (New York, Stechert, $2.20.)

Halsted, G. B. The elements of geometry. New York, *Wiley*, 1885. 16+366 p., illustr. 8°. $1.75.

Hermite, M. C. Sur quelques applications des fonctions elliptiques. Fasc. i. Paris, *Gauthier-Villars*, 1885. 146 p. 4°. (New York, Christern, $2.50.)

Holder, C. F. Marvels of animal life. New York, *Scribner's Sons*, 1885. 10+240 p., illustr. 8°. $2.

Homan, G. *ed.* A sanitary survey of St. Louis, being a series of short papers on leading public health topics contributed by city officials and local sanitarians. Concord, N. H., *Repub. pr. ass.*, 1885. 77 p., 3 maps. 8°.

Huyghens. Traité de la lumière. Edited by W Burchhardt. Lipsiae, *Gressner & Schramm.* 4+134 p., illustr. 8°. (New York, Stechert, $2.20)

Jordan, W. Grundzüge der astronomischen zeit- und ortbestimmung. Berlin, *Springer*, 1885. 8+364+26 p., illustr. 8°. (New York, Stechert, $3.70.)

Justus Perthes in Gotha, 1785–1885. [Gotha, 1885.] 108 p., portr. 4°.

Karlowa, O. Römische rechtsgeschichte. Band i.: Staatsrecht und rechtsquellen. Leipzig, *Von Veit*, 1885. 8+1031 p. 8°. (New York, Christern, $9.55.)

Krenkel, M. Klassische bühnendichtungen der Spanier. II. Calderon, Der wundertätige zauberer. Leipzig, *Barth*, 1885. 20+349 p. 8°. (New York, Stechert, $2.)

Laughlin, J. L. The study of political economy. New York, *Appleton*, 1885. 153 p. 12°.

Le Conte, L. J. Are not dynamite catastrophes intimately associated with electric phenomena? (*Tech. soc. Pacif. coast.*–2) 1885. 8°.

Leray, Le P. A. Essai sur la synthèse des forces physiques. Paris, *Gauthier-Villars*, 1885. 10+180 p., illustr. 8°. (New York, Christern, $1.65.)

Lipsius, R. A. Philosophie und religion. Neue beiträge zur wissenschaftlichen grundlegung der dogmatik. Leipzig, *Barth*, 1885. 319 p. 8°. (New York, Stechert, $1.90.)

Mascart, E. und **Joubert**, J. Lehrbuch der elektricität und des magnetismus. Autorisirte deutsche übersetzung von Dr. L. Levy. Band i. Berlin, *Springer*, 1886 (1885). 20+592 p., illustr. 8°. (New York, Stechert, $5 20.)

Meyer, A. M. On a method of precisely measuring the vibratory periods of tuning forks, and the determinations of the laws of the vibrations of forks; with special reference of these facts and laws to the action of a simple chronoscope. (*Mem. Nat. acad. sc.* 3) 17 p., 4 pl. 4°.

Moore, E. H., jr. Extensions of certain theoroms of Clifford and of Cayley in the geometry of *n* dimensions. New Haven, Conn., *Acad. sc.*, 1885. 18 p. 8°.

Newbery, J. C. The examination of waters. Melbourne, *Mason, Firth & M'Cutcheon, pr.*, 1885. 9 p. 16°.

Normand, J. A. Etude sur les torpilleurs. Paris, *Gauthier-Villars*, 1885. 88 p. 4°. (New York, Christern, 70 cents.)

Packard, A. S. On the structure of the brain of the sessile eyed Crustacea. (*Mem. Nat. acad. sc.* 3.) 14 p., 5 pl. 4°.

Scudder, S. H. Descriptions of an articulate of doubtful relationship from the tertiary beds of Florissant, Col. (*Mem. Nat. acad. sc.* 3.) 6 p. 4°.

Van Rysselberghe, M. F. Téléphonie et télégraphie simultanées. Précédé de notions préliminaires sur l'induction électrique, le téléphone et le microphone par E. Buels. Bruxelles, *Hayez, pr.*, 1885. 12+226 p., 7 pl. 12°. (New York, Christern, $1.65.)

Weygoldt, G. P. Die Platonische philosophie nach ihrem wesen und ihren schicksalen für höhergebildete aller stände. Leipzig, *Schulze*, 1885. 6+256 p. 12°. (New York, Stechert. $1.10.)

Wuelker, R. Grundriss zur geschichte der Angelsächsischen litteratur, mit einer übersicht der Angelsächsischen sprachwissenschaft. Leipzig, *Von Veit*, 1885. 12+532 p. 8°. (New York, Christern, $3 70.)

SCIENCE.—SUPPLEMENT.

FRIDAY, OCTOBER 23, 1885.

PRICES FROM 1873 TO 1884.

IN the annual report issued by the mint department on the production of precious metals in 1884, there are given statistics of prices during the years 1883 and 1884. These statistics are in continuation of others of the same kind in previous reports. The figures for the years from 1825 to 1880 may be found in the quarterly report of the Bureau of statistics, No. 3, 1883–84; those for the years 1881 and 1882 in the report of the director of the mint for 1883; those for 1883 and 1884 in the present report. All of them, we are informed, were collected and arranged under the superintendence of Mr. Burchard, the former director of the mint, to whom belongs the credit for the work. The investigation is one which does not lie very obviously within the scope of the mint department, and recognition is due to the intelligence and activity which caused it to be undertaken.

The different reports, taken together, purport to give a continuous account of the fluctuations of general prices from 1825 to the present time. Such an account, if accurate and trustworthy, would be of great interest and value. Unfortunately the statistics have not been got together in a very careful way; and the general results which are deduced from them can be accepted only with liberal allowance for possible errors.

To the method adopted there can be little objection. It was to take the wholesale prices of a number of articles in New York, to reduce them to a common denominator, and then to calculate the arithmetical mean of the prices as reduced.

It can be easily illustrated by an example. Suppose that for three years the prices of cotton, wheat, and pig-iron, were as follows:

	1880.	1881.	1882.
Cotton	.10	.12	.08
Wheat	1.00	.80	1.50
Iron	20.00	30.00	40.00

Indicate the price of each article for the first year by 100, express the prices for the following years in percentages on that basis, and calculate the averages. The result is:

	1880.	1881.	1882.
Cotton	100	120	80
Wheat	100	80	150
Iron	100	150	200
Average.	100	116⅔	150

The average, or arithmetical mean, of the percentages here indicates a rise in prices over the average of 1880, of 16⅔ per cent in 1881, and of 50 per cent in 1882.

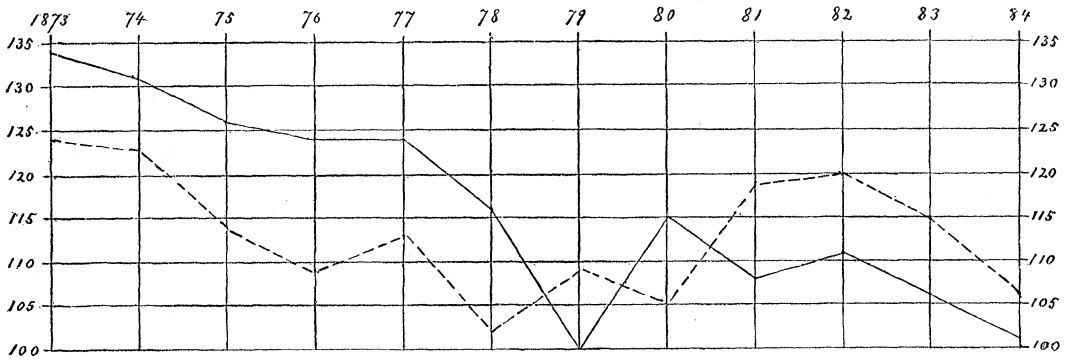
If the prices of a sufficiently large number of articles be taken, the averaged percentages indicate with sufficient accuracy the general rise or fall of prices. This is the method adopted in the mint reports; and it is also adopted in the *London economist's* annual table of prices. If applied with care, it is probably the safest way of calculating the rise and fall of general prices. Objections to it have been much urged, and other methods of calculation have been suggested and tried; but the various experiments seem to show pretty clearly that the simple arithmetical mean of the prices of a large number of articles gives as good an indication of the general fluctuations as we can hope to get.

Unfortunately the method has been applied with too little care and discrimination in the tables before us. In the first place, one cannot be sure that the prices quoted are the real market prices. For the years previous to 1873, they are taken bodily from two Treasury reports, those for 1863 and for 1873, in which tables of prices for a long series of years were brought together. There has always been a suspicion that these prices were largely made up by the clerks in the Treasury office, and that they were not worth much as a record of the real fluctuations. For the years after 1873, the figures were gathered specially for these mint reports, and may be more trustworthy. But even here there are obvious mistakes and inconsistencies. For instance, instead of taking the same articles consistently year by year, and deducing the average prices of these, the list changes almost every year. Thus for 1881 and 1882, the prices of 88 articles are given; in this year's report, however, for 1883 and 1884, those of 94 articles are taken. In other words, it is as if the prices of one set of articles for this year were compared with the prices of another set of articles for next year; a method which obviously, so far as the two sets vary, vitiates any comparison between them. It is part of the same error in these tables, that an article, after having been quoted and reckoned for a few years, suddenly disappears entirely, while another one perhaps takes its place, and is reckoned in the general average. One is therefore not surprised to find the results to be on their face inconsistent with each other. Thus the average

prices of 1884 are given as 92.2 per cent of those of 1883; yet side by side other figures are given which make the ratio 91 per cent.

Nevertheless, it would be going too far to say that the results are quite without value. A very large number of articles are included in the comparison, which gives a probability that the mistakes will balance each other, or will not appreciably affect the general results. It is not unreasonable to believe that the figures which are finally given as indicating the rise and fall of general prices for the successive years, although they cannot be accepted as an accurate gauge of the ascertainable change from any one year to the next year, yet represent fairly enough the general fluctuations of the series of years. They are at all events probably as good an index of the actual changes as the tables of the *London economist*, which have been much quoted and used. We reproduce the mint figures in the accompanying chart for the years since 1873, and for comparison give also the *Economist* figures, which indicate the course of prices in England. It should be said that, for both countries, the standard (indicated by the number 100) is the average range of prices of the years 1845–50. Those were the years just before the Australian and Californian gold discoveries, and the average for them has always been used by the *Economist* as the basis of comparison in its table of prices.

We have arranged the mint figures on the same basis, using for that purpose the figures for 1845–50 given in the earlier mint report. This method of comparison is of course open to objections, but seems on the whole to be the best:



PRICES IN ENGLAND ——————

PRICES IN UNITED STATES - - - - - - - - - - - - - - - - -

The figures begin with 1873, a year of speculation and of inflated prices all over the world; and it will be seen that in both countries prices fell continuously during the long years of depression from 1873 to 1878. The fall in England was from 134 to 116; and in England there was in 1879 a still further fall to 100. That is, in 1879 prices in England had gone down to the level of the years 1845–50. In this country, the fall from 1873 to 1878 was from 124 to 102. The revival began here earlier than in England, and from 1878 to 1879 there was already a rise from 102 to 109. After 1879 the tendencies in both countries for a few years was to a rise. A temporary fall, it is true, is indicated in the United States from 1879 to 1880; but one cannot but look at this fall with suspicion, and ascribe it, at least in part, to some of the mistakes made in calculating the mint figures. In England the highest point since 1878, according to the *Economist*, was reached in 1880. But there are reasons, which there is not space to explain, for ascribing the high figure for that year to the peculiar methods of the *Economist*, and for believing that there was in reality but little fall in 1882 as compared with 1880. In the Uuited States there was a fairly steady rise from 1878 to 1882. Since 1882 there has been a steady fall in both countries. Last year (1884) prices were at 101 in England, and at 106 in this country; in other words, notwithstanding the severe depression, they had not gone so low as the lowest points reached during the last period of depression in England in 1879, and in this country in 1878. F. W. TAUSSIG.

THE NEW PHILOLOGY.

THE new school of philology in Germany, of which Professor Brugmann is one of the ablest representatives, claims to be a legitimate advance on its predecessors in the direction of scientific sobriety and precision. The older scholars from Bopp down to a few years ago, says Sievers (in his article on Indo-Germanic philology, in the Encyclopædia Britannica), had naturally occupied

themselves largely with glottogonic problems; and some of them had adopted misleading metaphors, as Schleicher in his theory that language was an organism, and linguistics one of the natural sciences. Brugmann, in a recent pamphlet,[1] charges further that mechanical methods were employed in comparisons of words, as when the fullest form was judged to be always the oldest. The new school discards glottogonic problems, on the ground that the materials for their discussion are, at least at present, insufficient, rejects the misleading metaphors, and abstractions in general, and professes to confine itself to known facts. But the principle on which it lays most stress is that "our general views of language and methods of comparison should be formed after study of living languages, because these alone are controllable in detail, and can give an insight into the motive forces that shape and modify language" (Sievers). The most prominent of these forces are held to be two: phonetic variation, to whose laws there are no exceptions, and which is differentiating in its tendency; and analogy, an assimilating force, whose procedures cannot be reduced to rule. An example of the first is the separation of the old English short *a* (pronounced as in Italian) into two sounds, that in *mare* before *r*, and that in *make* before all other consonants; an example of the second is found in the plural of *book*, which was formed in the older language simply by change of vowel, like *feet* from *foot*, but was afterwards assimilated to other plurals in *s*.

These are the views that Brugmann defends in his pamphlet. It consists of three pieces. The first, an address delivered when he entered on the duties of his university chair, is a statement of the relation between linguistics and philology. Defining the latter, after Böckh, as the science that investigates the historical manifestation of the mind of peoples, that is, their development of culture, he points out that the science of language is merely one branch of this larger department, and that all attempts to draw a line between them have failed. After exhorting scholars of all linguistic departments, wider and narrower, Indo-Germanists, Hellenists, Latinists, Germanists and others, to work in harmony, he gives a short sketch of the progress recently made in the systematic investigation of the general vital conditions of language. The foundation for this, he says, was laid by Wilhelm von Humboldt, and Steinthal, and W. D. Whitney had also contributed; Scherer, in 1868, showed the importance of analogy in the explanation of older forms, and Leskien soon after announced the doctrine that the laws of phonetic variation are in themselves subject to no exception. Other scholars, among whom are Osthoff, Paul, Delbrück, Sievers and Brugmann, have continued the investigation and application of principles. Brugmann closes with the expression of the opinion that for young students of classical and Germanic philology, while Sanskrit is important, it is still more important to understand the nature of language and the laws that govern its growth.

The second and longest paper is Brugmann's reply to a 'Criticism of the latest linguistic investigations' by Georg Curtius, whose recent death has deprived Indo-Germanic philology of one of its most distinguished and useful workers. Curtius had treated of four points: phonetic laws, analogy, the Indo-Germanic vowel-system, and the origin of primitive Indo-Germanic forms; Brugmann takes these up in the same order. The principle of the constancy of phonetic laws, defended by the new school against Curtius, is understood by them to mean that the same sound under the same conditions always moves in the same direction and undergoes the same change,—there are no exceptions or irregularities. Brugmann draws his proof of this proposition from a consideration of the physical and psychical processes concerned in the production of words, and the way in which the individuals of a community act on one another in the production of sounds. Phonetic change, he says, is at the same time a psychical and a physical process: individuals are constantly modifying their pronunciation, but the modifications are controlled by the necessity of being understood by the community, and thus all the members of the community necessarily move on together; when the phonetic change is completed, it is inconceivable that in different words different courses should be taken, for the pronunciation is not learned separately for each individual word, but the same phonetic conditions necessarily induce the same feeling and the same pronunciation. Curtius insists that many unexplained cases of phonetic change exist, and that an inductive demonstration of the constancy of the law of phonetic change is impossible. Brugmann admits that such demonstration is, in the nature of the case, impossible, since so much of the necessary material has perished, but holds that the number of unexplained changes is constantly diminishing, many of the seeming 'exceptions' to rules depending on false etymologies, or resulting from the fact that one dialect has borrowed from another, in which different laws of literal interchange exist, or being otherwise explicable. Curtius thinks that a letter is sometimes retained in a particular form, when it has disappeared from

[1] *Zum heutigen stand der sprachwissenschaft.* Von Karl Brugmann. Strassburg, *Trübner*, 1885. 144 p. 8°.

phonetically similar forms, because it was felt to be significant; Brugmann replies that the processes of phonetic change are unconscious, quite ignoring the meaning of sounds, as, in fact, we often find that phonetic decay removes letters that we know to have been originally significant.

The second principle discussed by Curtius, analogy, is one the influence of which has always been more or less acknowledged by writers on language; but it has usually been regarded as a secondary and sporadic force, leading (as the current expression 'false analogy' indicates) to malformation and confusion. The new school holds, on the contrary, that analogy is a natural, universally active force, equally prominent in the processes of forming and of learning languages. In our ordinary speaking, words present themselves to us in groups, and a new word is assigned to its most natural group, and treated accordingly. "The action of groups is, along with phonetic change, at least in our observation of accessible periods, the most important factor in the development of language" (Paul). A familiar example in English is the tendency to convert strong preterites into weak, as 'crowed' instead of the old 'crew.' The analogic process, being thus assimilative, acts in opposition to the differentiating influence of phonetic change, which more commonly tends to destroy the similarity between words. The younger philologists call in the principle of analogy to account for a number of phonetic phenomena, which the older generation of scholars either treated as unintelligible anomalies or endeavored to explain by referring them to the desire to retain significant letters, etc. Curtius objects to this wide extension of the principle, on the ground that its employment is arbitrary, and that it rests on no better basis than the admitted usage of modern languages. Brugmann rejoins that there is no reason to suppose a difference in this respect between ancient and modern languages; and Delbrück, in his 'Einleitung in das sprachstudium,' endeavors to define the character of analogical change.

The third and fourth points of Brugmann's reply to Curtius relate to questions of Indo-Germanic grammar, such as whether the primitive Indo-Germanic language had not only the vowels *a*, *i*, *u*, as the older school holds, but also *e*, *o*, together with diphthongs and sonant nasals and liquids, and what the origin of the inflections was. Brugmann remarks that the new philology does not absolutely avoid all glottogonic or morphogonic problems, but only those in which there are clearly not sufficient data for a solution; and whether it is worth while to attack any given problem, each man must decide for himself. Finally, in the third piece of his pamphlet, Brugmann replies to some points made by Johannes Schmidt.

The new philological school may be said to represent a more rigid adherence to law in the treatment of linquistic questions. While gratefully acknowledging the eminent services rendered to the science of language by Bopp, Grimm, Pott, Benfey, Schleicher, Curtius, and others, it claims to carry out more consistently the principles they lay down, and to fill in part the gaps they left.

C. H. TOY.

CHEMICAL NOMENCLATURE.

A COMMITTEE of fourteen chemists, including such eminent men as Williamson, Frankland, Crum Brown, Odling, and Armstrong, presented their third report on chemical nomenclature to the British association at the Aberdeen meeting. This committee was entrusted with the duty of "drawing up a statement of the varieties of chemical names which have come into use, and of indicating the causes which led to their adoption, as well as considering what can be done to bring about some convergence of the views on chemical nomenclature obtaining among English and foreign chemists."

This weighty committee produce, as might be expected, an eminently conservative report; they regard as ill advised any attempt, on etymological grounds, to change a system so firmly established as that involved in the present use of the prefixes *hypo* and *hyper*.

After confirming the terminations *ic* and *ous*, the committee considers the minor question how far the termination *ous* ought to be written in the forms *ious* and *eous*. The answer is: as seldom as possible; cupreous has given way to cuprous, and 'ruthenious' and 'iridious' should also lose the superfluous *i*.

In answer to the question whether the termination *ic* should be employed in the names of salts of which only one class is known—as magnesic sulphate instead of magnesium sulphate, the committee says: "There is something to be claimed for both systems; and, as the diversity of practice does not lead to confusion, the question need not be regarded as vital." In our opinion, the committee might have exerted their influence to suppress the use of the unmeaning and often non-euphonious termination *ic*. Such terms as 'zincic' and 'nickelic' offend the ears of hearers; 'scandic' and 'ytterbic' would be unwelcome.

The committee calls attention to the advantage of affixing the syllable *ic* to the names of positive radicals in ethereal salts. The ambiguity arising in *speaking* ethyl phenylacetate, which might be taken for ethylphenyl acetate, can be obviated by

saying ethylic phenylacetate, and ethylphenylic acetate.

It is further remarked that of late years chemists have not been sufficiently careful in applying numerical designations to substances; thus arsenious oxide is sometimes called arsenic trioxide, although the formula of gaseous arsenious oxide is As_4O_6.

The committee considers at some length the nomenclature of acid salts, of basic salts, of sulphur salts and of double salts, pointing out some inconsistencies, suggesting some changes and proposing, very sparingly, new terms. Being the third report, many topics treated previously are not touched, and the report is consequently not very wide-reaching.

In this connection, we remark that the London chemical society, a few years ago, issued to the abstracters for its journal a series of instructions on chemical nomenclature and notation, which have been of the greatest service in securing uniformity in writing chemical language. American chemists are largely following the instructions and simple rules there laid down; and, so far as the English language is concerned, a commendable uniformity and perspicuity already obtains.

H. CARRINGTON BOLTON.

POISONOUS WATERS IN THE COCOS OR KEELING ISLANDS.

IN a recent book of travel[1] from the pen of Henry O. Forbes of Aberdeen, Scotland, an account is given of a visit to the Cocos or Keeling Islands, which contains some new facts bearing on the history of coral islands that are specially interesting, as they supplement the studies of Charles Darwin at the same locality. The Keeling Islands, as they are usually called, are situated in the Indian Ocean about 800 miles southwest of the Straits of Sunda. They were visited by Darwin in 1836, and by Forbes in 1878. It was while exploring these islands that Darwin's well-known hypothesis of the formation of coral reefs and atolls first suggested itself.

One of the most instructive portions of Mr. Forbes's observations relates to the rising of poisonous waters in the lagoon enclosed by the Keeling Islands, immediately after a cyclone which occurred January 28, 1876, a description of which was furnished by Mr. G. C. Ross, the present proprietor of the islands.

On the 25th the mercurial barometer indicated some unusual atmospheric disturbance, and the air felt unusually heavy and oppressive. On the 28th it fell to close on 28 inches, a warning which gave time for all boats to be hauled to a place of safety, and other preparations for a storm to be made. On the afternoon of the same day there appeared in the western sky an ominously dark bank of clouds, and at 4 P.M. a cyclone of unwonted fury burst over that part of the Indian Ocean. About midnight on the 28th the sea rose suddenly, and rushed inland more than 150 yards from high water mark. The storm attained its greatest height about one o'clock on the morning of the 29th. At that hour no object raised a foot or two above the ground could resist its fury. The inhabitants saved themselves only by lying in hollows of the ground. To what distance the barometer might have fallen it is impossible to say, for the mercurial was carried away; two aneroids gave it at 26½ inches.

The following morning broke bright and calm, but not a speck of green could be seen anywhere within the compass of the islands. Round the whole atoll the solid coral conglomerate floor was scooped under, broken up and thrown in vast fragments on the beach. On the eastern shore of Home Island, Mr. Forbes observed a wall of many yards breadth, portions of which had been thrown up clear over the external high rim of the island, and several yards inward among the cocoanut trees.

About 36 hours after the cyclone the water on the eastern side of the lagoon was observed to be rising up from below of a dark color. The origin of the spring, which continued to ooze out for about ten or fourteen days, lay somewhere between the north end of New Selima and the north end of Gooseberry Island. Its color was of an inky hue, and its smell 'like that of rotten eggs.' From this point it spread southwest as far as the deep baylet in Southeast Island, where, meeting the currents flowing in at the westward and northern entrances, which run, the one round the western, the other round the eastern shore of the lagoon, its westward progress was stopped; whereupon, turning northward through the middle of the lagoon (becoming slightly less dark as it proceeded) it debouched in the ocean by the north channel. Within twenty-four hours every fish, coral and mollusk, in the part impregnated with this discoloring substance —probably hydrosulphuric or carbonic acid—died. So great was the number of fish thrown on the beach, that it took three weeks of hard work to bury them in a vast trench dug in the sand.

At the time of Mr. Forbes's visit the islands were slowly recovering from this sad disaster. He carefully examined that part of the lagoon over which the poisoned waters flowed, and described its effect as follows: "The whole eastern half of the lagoon

[1] *A naturalist's wanderings in the Eastern Archipelago.* A narrative of travel and exploration from 1878 to 1883. New York, *Harper*, 1885. 8°.

was one vast field of blackened and lifeless coral stems, and of the vacant and lusterless shells of giant clams and other mollusks, paralyzed and killed in all stages of expansion. Everywhere both shells and corals were deeply corroded, the corals especially being in many places worn down to the solid base. Since the catastrophe there has been, till almost the date of my visit, no signs of life in that portion of the lagoon ; I saw only a very few fishes, and only here and there a new bunch of Madrepora and Porites."

A similar field of dead corals was observed in this lagoon during the visit of the Beagle in 1836. The destruction of the corals was accounted for by Darwin, by assuming that Southeast Island had at one time been divided into several islets by channels whose closing up had prevented the water in the lagoon from rising so high as formerly; and that, therefore, the corals, which had attained their utmost possible limit of upward growth, must have been killed by occasional exposures to the sun. This statement is cited by Forbes who, judging from the fact that an earthquake took place at the Keeling Islands two years before the visit of the Beagle, considers it very probable that an eruption of poisoned water, like that of 1876, may have been brought about by the earthquake, and may have caused the death of the corals observed by Darwin.

Mr. Forbes thinks that an earthquake took place at the time of the cyclone in 1876, although no tremblings of the earth were noted by the people on the island. He considers "the waves, as well as the darkened waters which were issued, doubtless from a submarine vent, as almost certainly the result of volcanic disturbance in close vicinity of the atoll." It seems to the present writer, however, that this hypothesis is but poorly sustained by the facts observed. A similar rising of the waters is recorded in connection with other cyclones. Chain Atoll, in the Low Archipelago, was completely devastated by a hurricane in 1825, during which not less than 300 lives were lost. Thus in two instances, the agitation of the sea about atolls during great storms has been so great as to suggest earthquakes, yet no shaking of the land was recorded in either instance. The only safe conclusion, therefore, seems to be that extremely violent storms are capable of causing the sea to rise to a much greater height than had been supposed. On the other hand, certain writers, who consider that earthquakes may be brought about by a dimunition of atmospheric pressure, might claim these as striking illustration of their hypothesis, providing positive evidence of the occurrence of earthquakes in connection with the storms could be had.

The eruption of this colored water, charged with sulphuretted hydrogen etc., in the lagoon of the Keeling Islands, might perhaps be accounted for, by assuming that the relief of atmospheric pressure, during the cyclone, allowed the gases originating from the decomposition of organic matter imprisoned in the mud of the lagoon to rise to the surface. As the atolls are entirely of organic origin, it seems by no means improbable that organic matter in a state of decomposition might occur in the mud beneath the lagoon in quantity sufficient to account for the phenomena observed.

Another cause adequate to destroy mollusks, coral polyps, etc., in the lagoon of an atoll, is furnished by rain, which frequently freshens the water, as has been noted by both Darwin and Forbes.

THE NIPON CENTRAL EDUCATIONAL ASSOCIATION.

THE main object of this association is to promote the interests of education and science in Japan. Its regular meetings are held monthly in the Lecture hall of the Tokio university, and at these times a lecture is usually delivered by some prominent member, or papers upon educational or scientific subjects are read. There is a standing committee whose duty it is to give all possible information sought on the part of the local associations or others.

The association publishes monthly bulletins, which are distributed among its members. These bulletins contain reports or reviews of the lectures delivered and papers read at the regular meetings, and also other papers upon educational and scientific matters. The number of members of the association is, at the present time, about four thousand ; and it is a matter of congratulation that the number is monthly and yearly increasing. The government recognizes the association as one calculated to promote the interests of education and of science in general, and annually votes it a money appropriation or subsidy.

EXCAVATION OF THE TEMPLE OF LUXOR.[1]

OF all ruins, or groups of ruins, in the land of Egypt, the temples and tombs of 'hundred-gated Thebes' stand foremost in majesty, variety and number. Here six great temples mark the site of a city, which for many centuries was the capital of the known world. Of these six temples, the four on the left bank are known to travellers and readers of travels as Goornah, Dayr-el-Baharee, the Ramesseum, and Medinet Haboo ; the two on the right bank being Karnak and Luxor.

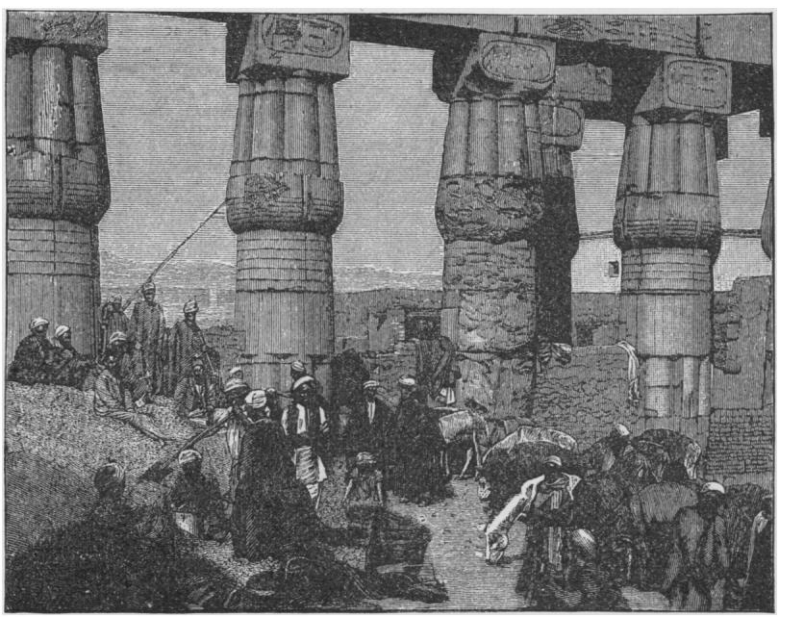
By far the most accessible, and consequently

[1]Condensed from the *Illustrated London news.*

the most familiar, of these half-dozen Theban temples, is the great Temple of Luxor, which has just been excavated by Professor Maspero. Yet, till now, Luxor has not in itself been nearly so rich in objects of interest as any of the neighboring sites. Not only was the great temple three-fourths buried under the accumulated rubbish of ages, but its courts and colonnades formed the actual nucleus of the Arab half of the modern village. The Moslem population has settled, apparently from mediæval times, in and around the temple, at the southward end of the mound. Here, building always with mud bricks crudely dried in the sun, each generation erecting its congeries of hovels on the ruins of the hovels made by its predecessors, the Arabs of Luxor have gone on from century to century accumulating rubbish upon rubbish and mud upon mud, till they have thrown up an artificial hill some forty-eight or fifty feet in height. As the hill rose, the temple necessarily became swallowed up.

To sweep away all these barracks, stores, houses, huts, pigeon-towers, stables and refuse-heaps, has been the earnest desire of Professor Maspero, ever since his acceptance of the important post left vacant, in 1881, by the death of Mariette Pasha. He obtained from the Egyptian minister of public works the necessary authorization for treating with the fellaheen, the basis of the negotiation being that each squatter should receive a cash indemnity for his house and a piece of land equivalent in extent to the area covered by the said house and its dependencies. It was further arranged that the Egyptian government should find the money for the liquidation of the indemnities. Some of the temple-folk would sell, and some stoutly refused to be bought out, except upon such terms as made negotiation well-nigh impossible. Meanwhile, there was another financial question to be settled,—namely, the expenses of excavation. The Egyptian government had paid the indemnities, and could do no more; yet, to get rid of the squatters was of little avail so long as there remained fifty feet of soil to be cleared and carted away. A subscription, simultaneouly started in the *Journal des débats* and the London *Times*, met, however, with so liberal a response (especially in Paris), that this question of ways and means was settled in two or three days, and in the month of July, 1884, the order was given to commence operations.

Our illustration shows the courtyard of Amenhotep III. with the excavations in progress. We here find ourselves admitted into the precincts of the courtyard, immediately behind the government store-house, of which one corner and a small window are seen between the pillars to the right. The spectator stands with his back to the Arabian chain and his face to the Libyan range, one long spur of the great western mountain and a glimpse of the Nile being visible behind the highest group of Arabs to the left of the picture. The mud huts, the mud walls built up between the columns, the asses, and goats, and village folk, are still in part occupation of the place. To the left, however, a hovel or two have been demolished; and, on the rubbish heap thus created, we see a group composed of two Europeans and some five or six better-class natives.



EXCAVATIONS GOING ON IN THE COURT YARD OF THE TEMPLE OF LUXOR.

— The *Athenæum* states that "somewhat late in the day the inhabitants of Syracuse have erected a monument to Archimedes."

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